Letters

TRAFFIC INFORMATION ON V.H.F.

Dear Sir – I have seen several references to the BBC'S proposed service for motorists on medium waves, most recently in D. J. Whythe's article (April 1977 *E & P*, p.313), but so far no comparison has been made with the system on v.h.f. which is now operational in West Germany and Austria. In its more sophisticated form, the motorist selects the region which interests him – for example, Southern Bavaria – and bulletins only from that region will break into radio programmes or taped music. Decoders are available in v.h.f. radios, or as inexpensive adaptors for existing sets.

That so few car radios in the UK now have v.h.f. (here, scarcely a set is sold without) is no long-term argument for a medium-wave service, which would still seem to require the purchase of a 550 kHz fixed-tuned receiver. Reception on v.h.f. in the UK may be more difficult, but I drove recently through Southern England in a car with v.h.f. radio; stereo reception was often possible, mono almost always so, and seldom did I need to switch to the inferior audio quality of medium waves.

Incompatibility is often the price of innovation – as I have patiently explained to Germans, who wonder why the BBC started t.v. on 405 lines. But in the face of a new and successful traffic service on v.h.f., the BBC's version on medium-waves might end up as the motorists Secam. – Yours faithfully,

T. R. PYE (M)
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24th May 1977

MAG. LEV. COMES DOWN TO EARTH

Dear Sir – Prof. Jayawant's article on 'Magnetically suspended vehicles for urban systems' (March 1977 *E & P*, p.235) produced a pair of irate letters in the May issue (p.369). Obviously neither author was aware of the other's intent and the 'crossfire' is quite striking. So is the extent of both authors' knowledge on the subject in question, as each in his own way goes beyond what he should in an effort (presumably) to knock Prof. Jayawant's work, just for the hell of it.

Mr. Gille, for example, would have written a timely and thoughtful contribution on the subject of mag. lev. His criticisms of the BR claims in the *New Scientist* (22nd April 1976) might indeed have been far more incisive. But he had to wander into the subject of propulsion by linear motor and, in condemning modern linear motors as 'heavy, inefficient and have a poor power factor', I would think that he was quoting the views of others rather than speaking from the experience of having built and tested full-scale linear motors for himself. The single-sided motor that propelled the Tracked Hovercraft Ltd. vehicle RTV 31 up to 108 mile/h against a 20 mile/h headwind within a distance of 1 mile is still the best high-speed motor in the world even though it now lies on the floor of my laboratory at Imperial College, some 4 years after the closure of the project. All other full-scale linear-motor projects had, until a year ago, used mechanical thrust boosters to attain high speeds. For the record, this l.i.m. weighed 1·95 t and gave a starting thrust of 2 tf with maximum thrust of 4·56 tf at 45 m/s. Its successor (had the project continued), the transverse flux motor (t.f.m.), would have more than doubled the power/weight ratio of the 2·5 MW RTV 31 unit. Again, for the record, a similarly rated rotary induction motor weighs roughly 7 t.

I can almost hear the rejoinder already: 'We were only discussing *urban* transport.' Fine, but what we learned about linear motors from high-speed designs was passed down to lower speed motors, and if Mr. Gille and his group will invest £15 (and a mine of information at the price) in a new volume called 'Transport without wheels' (Paul Elek, May 1977),* they can read about some very good linear motors built in the USA, Japan and other countries besides the UK. In particular, they will read of George Scelzo's Astroglide that conveys 12 000 passengers an hour between Dallas Airport and downtown Dallas, using British-built linear motors for 50 mile/h, and uses no power frequency converters. The use of linear motors in this project enabled each carriage to be relieved of over 1 t of equipment, increasing the payload per coach from 15 to 22 passengers. It seemed appropriate to me in this Jubilee year to fly the flag rather than to squabble amongst ourselves. The Astroglide runs on wheels, but is propelled by linear motors. Surely then, Mr. Gille cannot drag down mag. lev. *because* it 'involves a linear drive'.

Mr. Walmsley's letter was much more offensive to Prof. Jayawant at a personal level, which I think is deplorable, especially from one with so little engineering experience. But there is a chuckle at the end. Mr. Walmsley has a real side-swipe at university project groups – precisely the kind of group of which Mr. Gille is a member! – Yours faithfully,

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13th June 1977

*Of which I happen to be the Editor! (See review on p.578 – Editor)

CAN TACHYONS EXIST?

Dear Sir – In the article by R. A. Cooke, (May 1977 *E & P*, p.368), the statement occurs that the kinetic energy of a particle = $0{\cdot}5mv^2$, where m is its mass and v its speed, and from this the conclusion is drawn that, at the speed of light, the kinetic energy of the particle will be infinite owing to the infinite mass derived from Einstein's relationships. It is perhaps worthwhile to point out that, while it does not affect the general argument of R. A. Cooke's article, the relationship: kinetic energy = $0{\cdot}5\,mv^2$ depends on the assumption that m is independent of v, and so is a valid approximation at non-relativistic speeds only. The kinetic energy of the particle at any speed, v, is given by $mc^2 - m_0c^2$ where m is its mass at speed v, m_0 is its rest mass, and c is the speed of light in free space. Though the two expressions happen to give the same result (kinetic energy = ∞) for $v = c$, they are not equivalent and would give significantly different results for relativistic speeds significantly less than c. – Yours faithfully,

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& Electronics
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3rd June 1977

OLIVER HEAVISIDE

Dear Sir — I would agree with those correspondents (Feb. 1977 *E&P* p.115 and April 1977 *E&P*, p.289) who have recently drawn attention to the importance of the work of Oliver Heaviside in the development of electromagnetic theory. I am convinced, having studied the three-volume 'Electromagnetic theory' and the two volumes of 'Electrical papers', that practising engineers still have much to learn from his work.

Apart from these books, very little of Heaviside's enormous output was published. Yet we will only come to a full appreciation of the contribution made by Heaviside to the advancement of electrical science if we have access to this unpublished material.

I understand that the IEE assumed responsibility for the Heaviside papers (from his house at Paignton) at the time of his death and wonder whether this material is still available. Documents which were found in Newcastle upon Tyne are in the possession of the Post Office and I would very much like to know the whereabouts of this collection.

Finally, what has become of the definitive biography of Heaviside written by H. J. Josephs of which two copies were lodged with the IEE library? Apparently they are no longer there.

As I am anxious to track down these key documents I would be pleased to hear from anyone who has them, or others, in their possession or who can throw any light upon the history of this archive material. — Yours faithfully,

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England
2nd May 1977

[The IEE does possess most of the papers of Oliver Heaviside, both those collected from his house in Paignton after his death, and others which were found under the floorboards of the Paignton house in 1957. The entire collection consists of 21 working notebooks, several archive boxes filled with loose papers of miscellaneous notes, pamphlets, and letters to Heaviside from Kelvin, G. F. Searle, Fitzgerald and many other correspondents.

The biography of Heaviside by H. J. Josephs to which Mr. Watson refers is probably his typescript work 'A guide to the Heaviside collection of the Institution of Electrical Engineers', which includes much biographical information about Heaviside as well as a description of his papers.

Both the Heaviside papers and Joseph's description of them are now in the custody of the IEE Archives Department, and may be consulted at any time during office hours, preferably by prior appointment with the Archivist.

I have not been able to trace the location of the Heaviside documents once possessed by the Post Office in Newcastle, but the Post Office Records section will be glad to look if a general description of the material is sent to them. The person to contact is: Mrs. McNamara, Post Office Records, Room S-G 28, Post Office Headquarters Building, St. Martin's Le Grand, London E11A 1HQ. – IEE Archivist]

Dear Sir — The letter on 'Oliver Heaviside' in the February *E&P* (p.115) praised Heaviside's use of vector analysis for Maxwell's equations, contrasting with Maxwell's own use of quarternions. It is interesting to convert to vector form

Letters

the four alternative empirical laws of electrodynamics given in section 526 of Maxwell's 'Treatise on electricity and magnetism', (3rd Edn., 1891). The third law becomes:

$$F = \frac{ii'}{r^3}[(\mathbf{ds}'.\mathbf{r})\mathbf{ds} - (\mathbf{ds}.\mathbf{r})\mathbf{ds}' + (\mathbf{ds}.\mathbf{ds}')\mathbf{r}]$$

where, owing to a current i' in a circuit element **ds**', the force **F** acts on a circuit element **ds** carrying current i, **r** being the separation vector from **ds** to **ds**'.

This law is the only one of the four laws which includes the possibility of the simple inverse square law of mutual attraction we associate with Newton. For mutually parallel current elements, the first two terms cancel to leave the electrodynamic analogue of Newton's law of gravitation.

It was not until 1903 that the Trouton-Noble experiment sought to measure the electrodynamic interaction of two charges in parallel motion. This gave a result confirming that the first two terms must cancel. It gave a result conflicting with the Lorentz formulation and was the stimulus for Lorentz in 1904 to argue contraction in the apparatus and develop his famous transformations. Possibly, if Maxwell's third law of electrodynamics had appeared in vector notation in his treatise, it would have been recognised in 1903 as the correct law of electrodynamics. As it was, the transformation techniques of Lorentz were adopted in 1905 to launch Einstein's theory of relativity, but, even today, the mysteries of the cold-cathode arc remain unsolved. There are anomalous cathode forces acting in the line of current flow, suggesting that the **ds** term in Maxwell's third law of electrodynamics is an ever-present 'ghostly' reminder to heed the work of Maxwell and Heaviside. — Yours faithfully,

H. ASPDEN (F)
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14th May 1977

AUTOMATICALLY BETTER?

Dear Sir — Sir Monty Finniston's article mainly on the application of automation to the steel industry was very interesting, but I wonder if he, as ex-chairman of British Steel, could tell us the answer to a more basic question. Has nationalisation of the steel industry really enabled it to be run in a more cost-effective manner with adequate home and export output, compared with if it had been left to private enterprise?

The reason for the question is that, although the steel industry has been nationalised for some years, and presumably will remain so, nationalisation of other industries is still continuing and is of direct concern to many electrical engineers in these industries. — Yours faithfully,

K. M. KEEN (M)
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1st May 1977

[Sir Monty Finniston writes: Mr. Keen has posed a hypothetical question, an answer to which would generally be evaded by lawyers and politicians, since it is not possible to be certain about what might have been. All one can stand on is the record of what has occurred.

My opinion, prejudiced though it may be, is that the groundwork for a successful industry, organisation, equipment, manpower and skills, have all been improved through modernisation, rationalisation and development compared with these assets as they obtained pre-nationalisation. It is true that still more could have been done had it not been for a variety of unnecessary delays, not all within the control of the Corporation; and of course in the complex and inherited industrial relations scene of the steel industry, the Corporation has had its fair share of the industrial upsets which this country has experienced and which have not been to the advantage of any industry or the economy. The investment strategy of the Corporation to make the industry internationally competitive and hence nationally favoured by industry (which the private sector could not have afforded) has survived informed and misinformed criticism, and in those areas where the Corporation can be compared with the present private steel sector, i.e. in steel products made through the technology of the electric arc, I believe the private sector would speak favourably of the industrial performance of the Corporation.

As to exports and home supplies, the Corporation is the third largest direct exporter in this country, and if it has failed to meet home demand on occasion, this has not been because of lack of capability.]

TELECOMMUNICATION COMMENTS

Dear Sir — In your May issue (p.362) you were kind enough to devote some space to report a talk which I gave recently on the effect of regulatory action on the telecommunication market.

Unfortunately there were one or two minor misquotations in the article, and I hope you can afford me a little space to correct these.

I did not suggest that there might be mandatory PO supply of Viewdata terminals — the Viewdata display terminal is to be the domestic television receiver. I did suggest that some PTTs, who already insist on mandatory supply of such things as teleprinters and modems, might one day insist on supplying video terminal units (v.d.u.s.).

Speaking of the distortion of the s.p.c. p.a.b.x. market, the period I quoted was 4 years, not 5 as reported – Yours faithfully,

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19th May 1977

RELIEF FOR CALCULATORS

Dear Sir — Traditionally one of the accepted tools of the professional engineer has been the slide rule, but technical progress has now outmoded that tool and it has effectively been replaced by the electronic scientific calculator. Initially the cost of such calculators was high, and employers grudgingly purchased calculators for engineer usage, reluctantly accepting that improved efficiency would be the benefit. Naturally they did not purchase one per engineer, but demanded time sharing.

The descending prices of such calculators and the technical computing power available made personal purchase attractive to progressive engineers, thus eliminating the desirability of employers providing one calculator per engineer.

As I have already said, the slide rule was an accepted tool purchased by an engineer for use in his employment, and he was entitled to claim the cost under 'Expenses in employment' allowances on his income-tax return for the initial or renewal purchase and this claim has, in my experience and that of my colleagues, been accepted by Inspectors of Taxes. Unfortunately, however, the Inland Revenue do not appear to wish to move with the times, and claims for allowances for personal electronic scientific calculators are being hotly disputed.

It seems to me that here is a situation which should not be a local issue left to individuals to do battle; it really is a national matter and, furthermore, not confined to electrical engineers.

The Inland Revenue presumably for their own calculations have realised the advantage of electronic calculators over mechanical devices, but for some unknown reason are not prepared to accept that individuals in other professions should also benefit by technical advances.

Have other members attempted to claim an allowance for the personal purchase of a calculator for use in their employment, and if so how have they fared? — Yours faithfully,

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13th May 1977

MATHEMATICAL MATTERS

Dear Sir — I wish I could share your editorial enthusiasm (April 1977 *E&P*, p.279) for the plan to train 1500 teachers in mathematics, science etc. As a teacher for many years, I see little chance of this latest proposal being any more successful than previous pathetic, and even misleading, attempts to solve the problem. To say that the number of teachers to be involved seems small is probably the understatement of the year, particularly when it is likely that between 25% and 50% may not complete the course. After all, they will have opted out of mathematics and science, or failed to qualify, many years ago otherwise they would presumably already be in a job.

Training mathematicians in particular is a very slow process, somewhat akin to learning to play the piano, and although 'O'-level standard — the lowest for even junior school teachers — might be reached in a matter of months, the higher qualifications required for teaching in the middle and sixth forms of comprehensives will take a much longer time if this new breed of mathematicians is to be more than one page ahead of its students. It should be remembered that these teachers will be replacing a generation of teachers, now retiring, who were recruited during the economic repression of the 1930s, when even honours graduates had difficulty in obtaining a job.

It is recognised that Art education can only be successful if the student has a certain amount of natural ability, and it is possible that the mathematician also requires some basic talent which not everyone possesses. It seems strange that, after 107 years of compulsory education, nobody has investigated this problem or even appreciated that it exists. — Yours faithfully,

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